

**FACT SHEET AND
STATEMENT OF BASIS**

**EXXONMOBIL REFINING AND SUPPLY COMPANY
BILLINGS REFINERY
BILLINGS, MONTANA**

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
December 2008**

OPPORTUNITIES FOR PUBLIC INVOLVEMENT

***MDEQ Announces Proposed Decision for Treatment and Control of Contaminated
Subsurface Soils and Groundwater at the ExxonMobil Billings Refinery***

PUBLIC COMMENT PERIOD: December 22, 2008 to February 13, 2009

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DECISION SUMMARY

The Montana Department of Environmental Quality (MDEQ) has prepared this Statement of Basis to describe proposed remedies for groundwater and subsurface soil contamination at the ExxonMobil Billings Refinery, located in Billings, Montana. The Statement of Basis identifies the proposed corrective action remedies for contaminated groundwater and subsurface soils in three distinct areas and explains the rationale for remedy selection. In addition, this document briefly describes all other remedies considered during the remedy evaluation process.

MDEQ proposes to select remedies for groundwater and subsurface soil contamination that will include source control via vacuum enhanced recovery, capture zone wells, and two interceptor trenches; groundwater quality monitoring; institutional controls; phytoremediation plots; and air sparging. Also included in the proposed remedies is a requirement for future investigation and remediation of soils that are inaccessible at this time due to plant activity and operation.

MDEQ is soliciting public comment on the remedies during a public comment period, (December 22, 2008 through February 13, 2009). No public meeting is planned. However, during the public comment period, any interested person may request a public hearing. A request for a public hearing must be in writing and must state the nature of the issues proposed to be raised in the hearing. If a hearing is held, the MDEQ will provide notice of the public hearing date at least thirty days prior to the hearing.

MDEQ is issuing this Statement of Basis as a part of its public participation obligations under the Montana Hazardous Waste Act (MHWa). In addition, this document includes the fact sheet requirements in 40 Code of Federal Regulations (CFR) 124.8 as incorporated by reference in the Administrative Rules of Montana (ARM), Title, 17, Chapter 53, Subchapters 1 through 14.

I. SITE INFORMATION

The MDEQ is proposing remedies for the treatment and control of contaminated subsurface soil and groundwater at the site of the ExxonMobil Billings Refinery. The Refinery is located near Billings, Montana in the area known as Lockwood.

II. INTRODUCTION

1. *Site Description*

The ExxonMobil Billings Refinery (Refinery) located northeast of Billings, Montana has been in operation since July 1949. The Refinery has the capacity to process approximately 60,000 barrels per day of domestic and Canadian crude oil into refined petroleum hydrocarbon products, by-products, and intermediate products.

Refinery operations are conducted on 367 acres of 770 acres owned by ExxonMobil; leaving approximately 403 acres of undeveloped land surrounding the Refinery operations. The processing portion of the Refinery is bound to the south by railroad tracks and to the north by the Yellowstone River. To the east, the processing and operations portion of the Refinery is bound by the former coke storage pile area, the Refinery's wastewater treatment ponds, two inactive land treatment units, a former gravel quarry, and undeveloped land. To the west of the Refinery is undeveloped land and an island of the Yellowstone River. Beyond the property boundary are several businesses and residences. The site is currently zoned for heavy industrial use.

2. *Background*

In 1988, Exxon received permits for the Refinery from the State of Montana and the Environmental Protection Agency. The permits were issued for hazardous waste activities which included land treatment of oily hazardous wastes at three land treatment units (LTU), treatment of leaded tank bottoms in an open tank prior to off-site shipment, storage of hazardous waste in containers prior to off-site shipment, and facility-wide corrective action. The permits imposed requirements for operation of these activities, monitoring, reporting, and corrective action for releases of hazardous waste or hazardous constituents. Permits are issued for a term no longer than 10 years; ExxonMobil's permit was reissued in 1999 and includes requirements for continued operation and/or closure of an operating land treatment unit and associated vehicle decontamination pad, an operating waste staging area, two land treatment units undergoing closure, and a lead weathering tank undergoing closure. MDEQ and the EPA jointly issued the modules of the permit pertaining to facility-wide corrective action.

3. *Why A Remedy Is Required*

Because ExxonMobil managed hazardous waste on-site they were required to obtain a hazardous waste permit under the Resource Conservation and Recovery Act (RCRA) and the Montana Hazardous Waste Act (MHWA). RCRA is the federal law under which regulations concerning the management, treatment, storage, and disposal of hazardous waste are implemented. The MHWA is the state equivalent to RCRA. The Hazardous and Solid Waste Amendments of 1984 (HSWA) amended RCRA and included a requirement that owners and operators of hazardous waste facilities remediate releases of hazardous wastes or hazardous constituents from solid waste management units (SWMUs) and areas of concern (AOCs). A SWMU is any unit that was used at any time to manage waste, regardless of whether the unit was intended for that purpose. An AOC is any area at a facility having a probable release of a hazardous waste or hazardous constituent that may or may not be from a SWMU. The HSWA corrective action requirements are established in Section 3004(u) of RCRA and 75-10-406(7) of Montana Code Annotated (MCA) of MHWA. The requirements are codified in federal regulations at 40 Code of Federal Regulations (CFR) Section 264.101, as incorporated by reference in the Administrative Rules of Montana (ARM) 17.53.801. Through HSWA, Congress required that permits issued to hazardous waste facilities contain corrective action requirements for SWMUs/AOCs. The Montana Legislature directed the MDEQ to adopt a state equivalent program.

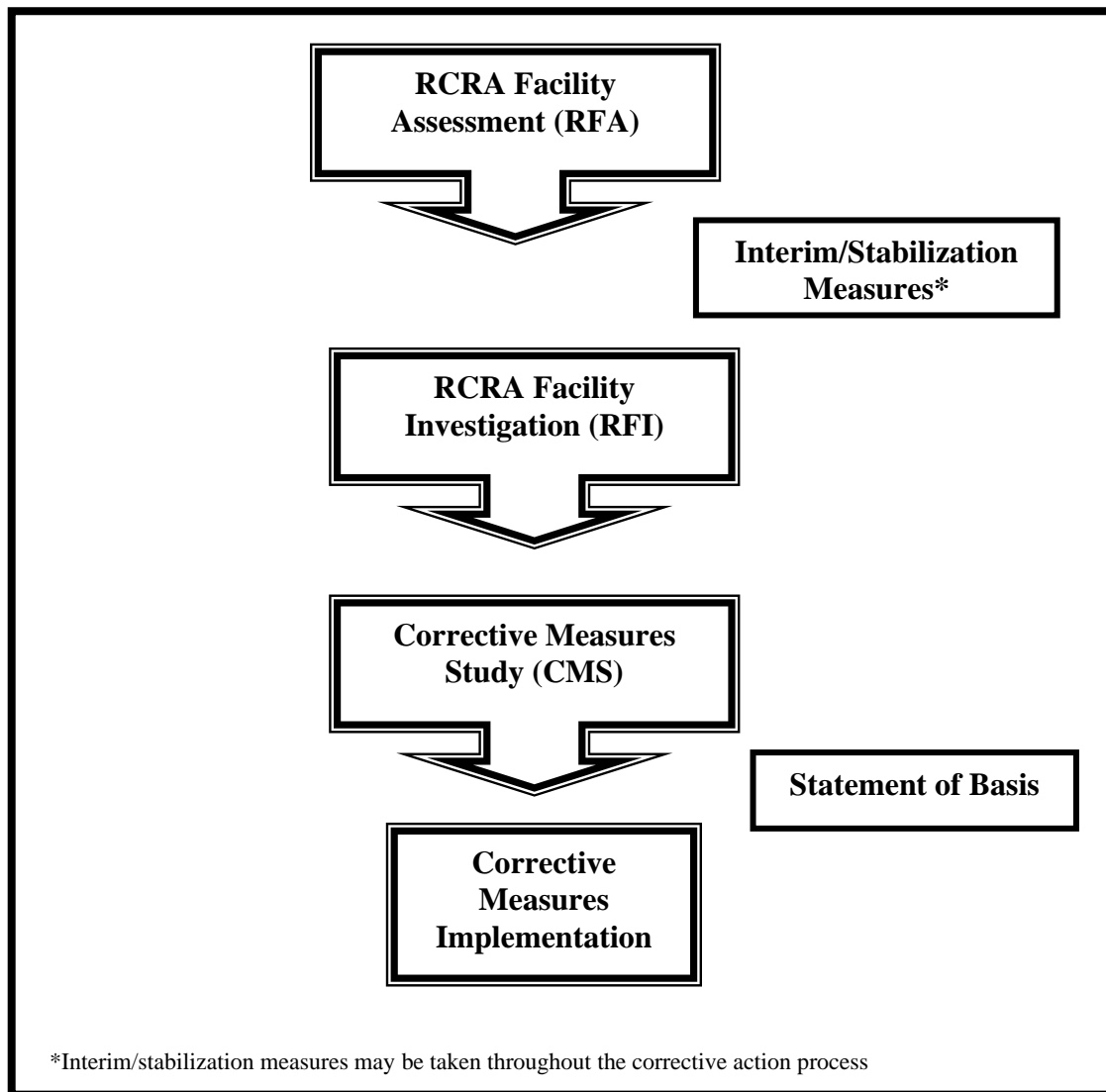
ExxonMobil managed wastes in a number of SWMUs/AOCs at the Billings Refinery. In 1999, the EPA along with MDEQ issued a HSWA Permit for the Refinery which required ExxonMobil to investigate all facility SWMUs/AOCs and develop a corrective measures study for the SWMUs/AOCs which are contaminated above acceptable levels. The MDEQ was authorized as the lead for corrective action in 2000.

III. CORRECTIVE ACTION

Corrective Action Process

The corrective action process generally comprises six activities. These activities are not always undertaken as a linear progression towards final facility cleanup, but can be implemented flexibly to most effectively meet site-specific corrective action needs. Figure A below shows a flowchart of the corrective action process:

Figure A. Flowchart of the RCRA Corrective Action Process



1. RCRA Facility Assessment (RFA)

Often the first activity in the corrective action process is the RFA. The objective of the RFA is to identify potential and actual releases from SWMUs/AOCs and make preliminary determinations about releases, the need for corrective action, and interim measures. The EPA completed the RFA for the Refinery in 1987.

2. RCRA Facility Investigation (RFI)

The RFI takes place when releases, or potential releases, have been identified and further investigation is necessary. The purpose of the RFI is to gather enough data to fully characterize the nature, extent, and rate of migration of contaminants to determine the appropriate response action.

A Phase I RFI at the Refinery investigated 21 SWMUs/AOCs and a report was completed in November 1993. The Phase I RFI was a preliminary study to develop a further understanding of the nature and extent of the contaminant releases at the Refinery. A Phase II RFI report, completed in December 1998, further investigated the lateral and vertical extent of contaminants in soil and groundwater.

A site-wide risk assessment is also conducted as part of the RFI. The risk assessment studies the health risks from potential exposure to the contaminants at the site. ExxonMobil completed a site-wide risk assessment in February 1999. Findings from the Risk Assessment are summarized below:

- *Summary of Site Risks*

The risk assessment for the Refinery was conducted in two phases. In 1995, ExxonMobil produced a Risk Assessment Scoping Document for the Refinery. In 1998, ExxonMobil produced the Final Risk Assessment for the Refinery.

For purposes of the risk assessment, the Refinery was divided into six exposure areas. Exposure areas 1-5 were located within the confines of the Refinery and were evaluated according to human health standards and potential impacts to terrestrial organisms. Exposure area 6 was the shoreline of the Yellowstone River and was evaluated using ecological criteria.

The chemicals of concern in the risk assessment were based on site samples collected during the RFI. The chemicals of concern in the soil were arsenic, beryllium, lead, mercury, anthracene, benzene, chrysene, ethylbenzene, naphthalene, phenanthrene, toluene, and total xylenes. The chemicals of concern in the surface water were antimony, arsenic, and toluene. The chemicals of concern in the sediment were arsenic, lead, benzene, toluene, and xylenes.

- *Human Health Risk Characterization*

In the human health evaluation in the risk assessment, ExxonMobil evaluated the potential risks to current and future on-site workers, future on-site construction workers, and current and future off-site residents for soil, groundwater, and sediment. ExxonMobil evaluated both cancer and non-cancer health risks from exposure to the site chemicals. Cancer risks are estimated as the increased change, over a lifetime, of a person developing cancer as a result of exposure to a potential cancer-causing chemical (carcinogen). Non-cancer health risks were

assessed by determining the hazard index (HI), or adverse affects of being exposed to several chemicals at one time.

The risk assessment stated that the potential site-wide cancer risks for the current on-site worker, future on-site worker, and future on-site construction workers at all exposure areas are well within or below the EPA acceptable range of one-in-ten-thousand (10^{-4}) to one-in-a-million (10^{-6}) probability of getting cancer. All potential noncancer risk estimates for current and future on-site workers were also found to be below the hazard index of 1, except for the future potential consumption of groundwater.

- *Ecological Risk Characterization*

In the ecological risk evaluation in the risk assessment, both terrestrial and aquatic receptors that are likely to be found on the property were evaluated. In an ecological risk assessment, when the Hazard Quotient (HQ) is less than one, it indicates that exposure is below a threshold level for toxicity, and it is unlikely that any adverse effects would occur. When the HQ is above one, there is potential for adverse effects, although there is no linear dose-response relationship between the magnitude of the HQ and the observed or predicted effects.

For surface soil, the HQs for terrestrial receptors potentially contacting soil in the Refinery are all less than 1.0. As a result, no adverse impacts would be expected to terrestrial wildlife residing on the Refinery proper.

For surface water, there were no HQs above 1.0 for exposure of birds, mammals, or aquatic life (fish, benthic invertebrates, or plants) to surface water in the Yellowstone River. Therefore, it was determined that there is no potential impact to ecological receptors exposed to surface water near the Refinery.

- *Risk Assessment Conclusion for Surface Soils*

Potential site-wide cancer risks estimated for the current on-site worker, future on-site worker, and future on-site construction workers at all of the Exposure Areas were all within or below the acceptable excess cancer risk range of 10^{-4} to 10^{-6} defined by USEPA. Potential site-wide non-cancer risks estimated for these receptors are all below the target threshold hazard index of 1.0 for non-carcinogenic effects.

For ecological receptors, it was concluded there is no apparent risk of adverse impacts to large or small terrestrial organisms potentially exposed to chemicals of concern in soil at each of the Exposure Areas.

Based on the findings from the Risk Assessment, site surface soils were determined to be within acceptable levels and were not evaluated further in the corrective action process.

- ***Risk Assessment Conclusion for Groundwater***

The potential risks associated with the consumption of groundwater by an on-site worker, using the limited assumptions provided in the risk assessment, give risk estimates greater than 1E-06 for chemicals with cancer effects and greater than 1.0 for non-carcinogenic effects. Therefore, groundwater corrective action continued to be evaluated in the corrective action process.

3. *Corrective Measures Study (CMS)*

After the RFI is completed and the regulatory agency determines that cleanup is necessary, the regulatory agency may require the owner/operator to conduct a CMS. The purpose of the CMS is to identify and evaluate cleanup alternatives, called corrective measures, for releases at the facility. The recommended measures are reviewed by the regulatory agency. The regulatory agency then selects what it believes is the best remedy, given the site-specific considerations. The CMS for the Refinery was completed in February 2005.

Media and Areas Evaluated for Corrective Action at the Refinery

With increasingly refined characterization of the ExxonMobil site, the six areas reviewed in the Risk Assessment were further refined into four remediation areas (the fire training area, interior refinery area, NAPL accumulation area, and river boundary area), see Figure 1, Appendix B. The refined grouping allowed for a more focused and efficient study and implementation of any necessary corrective actions.

In 2000, the Fire Training Area was singled out by the US Environmental Protection Agency (EPA) for a focused risk assessment. The results of the risk assessment indicated no unacceptable risk to human health based on current and expected future uses of the property. Therefore, corrective measures for the fire training area were not considered further in the

CMS.

The proposed remedies for the three remaining areas (interior refinery area, NAPL accumulation areas, and river boundary area) were limited to the subsurface soils and groundwater and are described in further detail in Section IV below. Findings during the risk assessment determined surface soils at the Refinery are below unacceptable risk values and remediation is not required.

4. *Statement of Basis*

After review of the CMS, the Department produces a document which describes the basis for remedy selection and provides the public with an opportunity to comment on the proposed remedies. Following public input, the remedy is finalized and included in the permit. When selecting remedies the following are considered: short- and long-term reliability and effectiveness; reduction of toxicity, mobility, or volume of hazardous constituents; implementability; and costs. This statement of basis fulfills this step in the remedial process.

5. *Corrective Measures Implementation (CMI)*

Once a remedy has been selected, the facility enters the CMI phase of corrective action. During the CMI, the owner/operator of the facility implements the chosen remedy. General requirements for conducting the CMI for the Refinery are included in the permit.

6. *Interim/Stabilization Measures*

Stabilization measures can be implemented at any time in the corrective action process to address ongoing releases and environmental threats in the near-term. Stabilization measures are established in an effort to control or abate immediate threats to human health and the environment and prevent or minimize the further spread of contamination. The following stabilization measures have been implemented at the ExxonMobil Billings refinery and are ongoing until the remedy selection is complete.

a. *Interior Refinery Area (IRA)*

Monitoring is conducted to identify changes in water quality in the IRA and is also used to monitor the thickness and changes in distribution for LNAPL. Groundwater quality monitoring

is conducted semi-annually and water level monitoring is conducted quarterly.

b. NAPL Accumulation Area

Vacuum enhanced recovery, a technology that uses pumps to remove various combinations of contaminated groundwater, separate-phase petroleum product, and hydrocarbon vapor from the subsurface, is conducted monthly in 21 wells located throughout the LNAPL accumulation areas. NAPL thickness is also measured monthly in all 21 wells. ExxonMobil has removed a total of approximately 321,281 gallons of hydrocarbon/water mixture from the groundwater. Based on a 4.6% product to water ratio an estimated 14,749 gallons of NAPL has been recovered.

Five wells also currently pump groundwater in an effort to create a capture zone which is intended to prevent any contaminants from being released into the Yellowstone River. Pumping wells SR95-1 and ERM-9B has been in operation since 1995. Pumping wells SM95-2, MW06-2, MW06-4 were placed in operation in August 2006. Pumping well MW06-1 was also installed in August 2006, but is not used unless needed. Fluids from the pumping wells are discharged to the refinery wastewater treatment system.

Two interceptor trenches have also been constructed, called the East Oil Interception Trench (EOIT) and West Oil Interceptor Trench (WOIT). Total fluids are pumped from the two interceptor trench sumps into an API Separator. Oil that accumulates on the water surface of the trenches that cannot be pumped to the API Separator is routinely removed as part of the vacuum enhanced recovery program.

c. River Boundary Area

ExxonMobil installed two pilot scale phytoremediation plots in May 2001. Phytoremediation utilizes plants to remediate soil and water. Phytoremediation works by utilizing photodegradation, enhanced rhizosphere biodegradation, hydraulic control, and phytovolatilization. Despite drought conditions, the trees in the phytoremediation plots were considered established at the end of the 2004 growing season. Monitoring and maintenance has been conducted each growing season since 2001.

A pilot air-sparge system was also installed in the River Boundary Area. The air-sparge system consists of injecting atmospheric air into the groundwater, which provides oxygen for biodegradation and also physically strips volatile compounds from the groundwater. The air-

sparge system was installed directly upgradient of the West Phytoremediation Plot in March 1999 and operated continuously until November 2001. The system was shut down during the winter of 2002, and restarted in June 2002, after which it has operated continuously.

IV. REMEDIAL ALTERNATIVES AND EVALUATIONS

1. *Summary of Alternatives*

Remedial alternatives were separated into three categories to address each respective remediation area at the Refinery. The three categories are the Interior Refinery Area, NAPL Accumulation Area, and River Boundary Area.

a. *Interior Refinery Area (IRA) (Figure 1)*

Results of the RFI indicate that the only medium of concern within the IRA is groundwater. Concentrations of dissolved-phase benzene in groundwater have been detected at levels above Montana water quality standards listed in Circular DEQ-7. Other BTEX (benzene, toluene, ethylbenzene, and xylenes) compounds as well as naphthalene are present in detectable concentrations; however, those concentrations have not exceeded the Circular DEQ-7 standards in recent years. Therefore, the only target chemical of concern in groundwater in the IRA is benzene.

As groundwater levels fluctuate throughout the year, a smear-zone is created in the subsurface soils. The raising and lowering of the contaminated groundwater creates a zone where residual contaminants adhere to subsurface soils when the groundwater levels drop in the winter. Because of this smear-zone, subsurface soils are also included in the remedy evaluations for the IRA.

The corrective measures objective for the IRA, not including the NAPL accumulation areas, is to remediate groundwater to below Circular DEQ-7 standards. Nine alternatives were evaluated for the interior refinery area (Appendix A, Table 1), and are briefly described below.

i. No Action

This alternative provides a baseline by which other alternatives are compared.

Under this alternative, groundwater impacts would be left in place and no

remedial efforts made. No monitoring, operation, or maintenance activities would be implemented.

ii. Institutional Controls

This alternative involves the prevention of direct contact with contaminated groundwater by limiting access. Access would be limited through the use of physical barriers, security monitoring, or on-site deed restrictions. Deed restrictions would limit disturbance of the subsurface and prevent future residential development and water well installations.

iii. Air Sparging

This alternative consists of a series of wells, with screens submerged below the groundwater table, connected to a compressed air supply. Atmospheric air is injected into the groundwater, which provides oxygen for biodegradation and physically strips volatile compounds from the groundwater.

iv. Enhanced Anaerobic Biodegradation

This alternative relies on existing anaerobic (oxygen deprived) hydrocarbon-degrading bacteria to remediate groundwater impacts. Additional electron acceptors, such as sulfates, are added to the subsurface to stimulate these bacteria and enhance anaerobic activity.

v. Enhanced Aerobic Biodegradation

This alternative relies on existing aerobic (oxygen enriched) hydrocarbon-degrading bacteria to remediate groundwater impacts. Nutrients and/or oxygen are added to the subsurface to stimulate these bacteria and enhance aerobic activity.

vi. Monitored Natural Attenuation

This alternative utilizes naturally occurring physical, chemical, and/or biological processes that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. This alternative requires groundwater monitoring to ensure the natural attenuation process is working.

vii. Oxygen Release Compound

This alternative increases oxygen levels in groundwater to create a better environment for biodegradation. The oxygen release compound is typically placed inside existing or newly installed groundwater wells or it is injected as a slurry into the subsurface at a level just below the water table. The groundwater reacts with the oxygen release compound, which in turn increases the dissolved oxygen concentration in the groundwater. Increased dissolved oxygen would enhance the hydrocarbon-degrading bacteria in the subsurface.

viii. Soil Vapor Extraction

This alternative consists of removing volatile hydrocarbons from the vadose zone by drawing air through the subsurface under vacuum conditions. The process enhances the natural rate of volatilization, and has been used with success at other sites to remove gasoline, chlorinated solvents, and other petroleum hydrocarbons from the soil. The recovered vapor can then be treated. This technology addresses both free-phase hydrocarbons, and residual phase hydrocarbons present in the smear-zone.

ix. Thermal Desorption

This alternative consists of thermally treating impacted soils in the subsurface. Specially designed equipment is used to heat the subsurface soils to high temperatures, thus changing the hydrocarbons from a liquid to a vapor-state which is then recovered. This technology does not address free-phase product, but does address residual product in the smear-zone.

b. NAPL Accumulation Areas (Figure 1)

NAPL is defined as Non-Aqueous Phase Liquids. NAPL Accumulation Areas are areas where free-phase NAPL plumes have been identified floating on the surface of the groundwater at the Refinery. There are 5 separate NAPL accumulation locations at the Refinery, all five areas lie entirely within the interior refinery area.

The NAPL at the Refinery will not migrate vertically below the water table except under special circumstances. Based on several years of monitoring and recent evaluations, it appears the NAPL is not migrating and distribution is stable or decreasing in extent.

ExxonMobil previously calculated the volume of the NAPL underneath the site to be approximately 293,000 to 628,000 gallons based on NAPL thicknesses measured prior to 1999. Since that time, the thickness of NAPL has decreased, which is believed to be a result of both Monitored Natural Attenuation (MNA) and vacuum-enhanced recovery.

The corrective measures objective for the NAPL accumulation areas is to recover free-phase contaminants from the subsurface to the extent practicable. Ten alternatives were evaluated for the NAPL accumulation areas. (Appendix A, Table 2)

i. No Action

This alternative provides a baseline by which other alternatives are compared. Under this alternative, NAPL would be left in place and no remedial efforts made. No monitoring, operation, or maintenance activities would be implemented.

ii. Institutional Controls

This alternative involves the prevention of direct contact with the NAPL impacts by limiting access. Access would be limited through the use of physical barriers, security monitoring, or on-site deed restrictions. Deed restrictions would limit disturbance of the impacts under current site use and prevent residential development and water well installations.

iii. Chemical-Enhanced NAPL Recovery

This alternative consists of injecting chemical surfactants into the subsurface to help mobilize NAPL for recovery. Special injection points along with recovery wells and pumping systems are required for NAPL recovery with this technology.

iv. Heat-Enhanced NAPL Recovery

This alternative consists of thermally treating the subsurface to influence the flow of NAPL. Specially designed equipment is used to apply heat while standard

recovery wells and pumping systems recover the NAPL.

v. In-Situ Soil Mixing

This alternative involves the use of specialized equipment to physically mix the impacted subsurface soil with a stabilizing agent where NAPL is present. Any NAPL present in the mixing area would be stabilized to prevent additional migration to groundwater. This technology may not address all NAPL present on the groundwater table.

vi. NAPL Recovery from Engineered Recovery Wells

This alternative could consist of several different technologies. Single-phase recovery is a method in which only hydrocarbon is extracted. This type of extraction is typically done by using skimmers, but it can also be performed by careful vacuum extraction. Dual-phase recovery consists of extraction of both hydrocarbon and water. In both cases, water and hydrocarbon are disposed of or recycled.

vii. NAPL Recovery from Trenches

This alternative consists of an excavated trench extending below the static water table at the down gradient end of a plume. The trench is typically backfilled with free-draining gravel to intercept groundwater and hydrocarbons. The intercepted liquids are routed to a collection sump for dual-phase or total fluids recovery. Fluids are then disposed of or recycled.

viii. Soil Vapor Extraction

This alternative consists of removing volatile hydrocarbons from the vadose zone by drawing air through the subsurface under vacuum conditions. The process enhances the natural rate of volatilization, and has been used with success at other sites to remove gasoline, chlorinated solvents, and other petroleum hydrocarbons from the soil. The recovered vapor can then be treated. This technology can address free-phase hydrocarbons, and it is effective in treating residual phase hydrocarbons.

ix. Vacuum-Enhanced NAPL Recovery

This alternative consists of placing an extraction tube in the well and applying a vacuum to remove LNAPL at an enhanced rate. The vacuum would pump both water and/or hydrocarbons from the well. In addition, the application of a vacuum to the subsurface also increases the rate of atmospheric air traveling through the subsurface soils, which provides an additional source of oxygen to enhance biodegradation of any impacts above the water table.

x. Water Flood Enhanced NAPL Recovery

This alternative consists of pumping groundwater from one area and reinjecting it into another area, via a trench or other method, to "mound" the groundwater table. This process induces a steeper hydraulic gradient that will enhance the flow of NAPL toward recovery wells or a trench.

c. *River Boundary Areas (Figure 1)*

The river boundary areas are discrete locations along the Refinery's river boundary at the northwest and northeast portions of the Refinery. Groundwater is the only media of concern in this area. The chemicals of concern in this area are benzene, arsenic, and lead, all of which have been detected in the groundwater adjacent to the river. Mercury has also been detected in soils in one location at the northeast area of the river boundary and was remediated under a separate corrective action process; therefore, it will not be further discussed in this statement of basis.

The corrective measures objective for the river boundary area is to prevent off-site migration of petroleum hydrocarbons at concentrations above Circular DEQ-7 standards. Eleven alternatives were evaluated for the river boundary area (Appendix A, Table 3).

i. No Action

This alternative provides a baseline by which other alternatives are compared. Under this alternative, groundwater impacts would be left in place and no remedial efforts made. No monitoring, operation, or maintenance activities would be implemented.

ii. Institutional Controls

This alternative involves the prevention of direct contact with the groundwater impacts by limiting access. Access would be limited through the use of physical barriers, security monitoring, and on-site deed restrictions. Deed restrictions would limit disturbance of the groundwater impacts under current site use and prevent residential development and water well installations.

iii. Air Sparging

This alternative consists of a series of wells, with screens submerged below the groundwater table, connected to a compressed air supply. Atmospheric air is injected into the groundwater, which provides oxygen for biodegradation and physically strips volatile compounds from the groundwater.

iv. Engineered Physical Barrier with Hydraulic Control

This alternative consists of a sheet piling or slurry wall installed to contain groundwater impacted with contaminants. Groundwater pumping wells would be strategically placed to recover groundwater and control the hydraulic gradient.

v. Engineered Treatment Barrier Wall

This alternative consists of a barrier wall or funnel and gate system constructed with a treatment zone. Contaminants are treated as groundwater flows through the treatment zone. The treatment zone would consist of a sparge zone where air would be injected to promote biodegradation and volatilization.

vi. Enhanced Anaerobic Biodegradation

This alternative relies on existing anaerobic hydrocarbon-degrading bacteria to remediate groundwater impacts. Additional electron acceptors, such as sulfates, are added to the subsurface to stimulate these bacteria and enhance anaerobic activity.

vii. Enhanced Aerobic Biodegradation

This alternative relies on existing aerobic hydrocarbon-degrading bacteria to remediate groundwater impacts. Nutrients and/or oxygen are added to the subsurface to stimulate these bacteria and enhance aerobic activity.

viii. Hydraulic Control

This alternative involves the installation of groundwater pumping wells set at strategic locations near the property boundary. Groundwater is pumped to manipulate the natural hydraulic gradient and prevent migration of contaminants off-site. The pumped groundwater is treated in the waste water treatment system before discharge.

ix. Monitored Natural Attenuation

This alternative utilizes naturally occurring physical, chemical, and/or biological processes that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. This alternative requires groundwater monitoring to ensure that the natural attenuation process is working.

x. Oxygen Release Compound

This is a low maintenance alternative that increases oxygen levels in groundwater for biodegradation. The oxygen release compound is typically placed inside existing or newly installed groundwater wells, or injected as a slurry into the subsurface at a level just below the water table. The groundwater reacts with the oxygen release compound, which increases the dissolved oxygen concentration in the groundwater.

xi. Phytoremediation

This alternative utilizes plants and their associated rhizospheric microorganisms to remediate groundwater. Phytoremediation can act in four ways, including phytodegradation, enhanced rhizosphere biodegradation, hydraulic control, and phytovolatilization. Phytoremediation can only work at sites where the concentration of contaminants is not toxic to the plants and where the groundwater impact is shallow enough for plant roots to intercept.

2. Selection Criteria

The alternatives listed above were evaluated for their ability to be implemented. If the alternatives were unreasonable for implementation, they were not further evaluated in the process. The alternatives that could be reasonably implemented were evaluated based on technical, environmental, human health, and institutional criteria (Appendix A Tables 4-6). A cost estimate was also developed for each alternative. Descriptions of the criteria used to evaluate each alternative are provided below.

a. Technical

The technical evaluation of the corrective measures alternative was based on performance, reliability, implementability, and safety. Performance was based on effectiveness of each alternative in performing its intended functions and the useful life of the alternative. Reliability of each alternative was evaluated in terms of the operation and maintenance requirements, and demonstrated reliability. Implementability of each alternative was evaluated in terms of constructability, time required to implement the measure, and time required to achieve beneficial results. Safety of each alternative was evaluated in terms of the potential threat to the safety of the surrounding community and site workers during its implementation.

b. Environmental

The environmental assessment focused on short- and long-term beneficial and environmental effects of the alternative and adverse effects on environmentally sensitive areas. The environmental assessment also addressed steps that must be taken to mitigate adverse effects.

c. Human Health

The human health assessment focused on protection of human health during implementation of each alternative as well as short- and long-term potential human health exposures to any residual impacts resulting from each alternative. The relative reduction of potential human health impacts from each alternative was compared with applicable criteria, standards, or guidelines.

d. Institutional

The effect of federal, state, and local environmental regulations, guidance, advisories,

ordinances, or community relations on the design, operation, and timing of each alternative was evaluated.

e. Cost Estimate

A cost estimate was completed for each alternative, which included labor costs, direct and indirect capital costs, and operation and maintenance costs.

V. PROPOSED REMEDIES

Proposed remedies are presented for the Interior Refinery Area, NAPL Accumulation Area, and River Boundary Area. Several technologies have been combined to create the proposed remedy for each area. A detailed evaluation of each of the proposed corrective measures alternatives is provided in Appendix A Tables 4-6.

1. Interior Refinery Area (IRA)

Monitored natural attenuation and institutional controls are the proposed remedies for the groundwater contamination in the IRA.

Natural attenuation is naturally occurring physical, chemical, and/or biological processes that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. Long-term monitoring in the interior refinery area has shown that chemicals of concern in the groundwater are being contained and remediated by natural attenuation processes. ExxonMobil will need to monitor natural attenuation to ensure it continues to be an effective remedy.

Institutional controls include the following:

- Site access restriction;
- An ExxonMobil prohibition preventing the installation of water supply wells and/or groundwater producing wells for any purpose in the impacted hydrostratigraphic units; and
- On-site deed restrictions.

Currently groundwater is not extracted from the impacted hydrostratigraphic units for

beneficial uses and restrictions are in place to prevent such usage. Deed restrictions would limit disturbance of the subsurface impacts under current site use and would prevent residential development and water well installations in the future.

2. *NAPL Accumulation Areas*

Vacuum-enhanced recovery using a mobile vacuum truck, the continued use of current recovery systems (capture zone wells and trenches), and institutional controls are the proposed remedies for the NAPL accumulation areas.

Vacuum-enhanced recovery consists of a mobile vacuum truck that applies a vacuum to wells or existing trench recovery systems to extract the NAPL from the well or trench. The process involves pumping out liquids (water and/or hydrocarbon) while extracting soil vapors from the same well.

ExxonMobil has been successfully using the vacuum-enhanced recovery method as an interim remedial measure at the Refinery. ExxonMobil will continue the operation of the current vacuum-enhanced NAPL recovery system, continue creating a capture zone with five total fluids recovery wells (SR95-1 ERM-9B, SM95-2, MW06-2, and MW06-4), and continue collecting contaminated groundwater from two interceptor trenches (EOIT and WOIT).

Institutional controls include the following:

- Site access restriction;
- An ExxonMobil Refinery prohibition preventing the installation of water supply wells and/or groundwater producing wells for any purpose in the impacted hydrostratigraphic units; and
- On-site deed restrictions.

Currently groundwater is not extracted from the impacted areas of the subsurface for beneficial uses, and restrictions are in place to prevent such usage. Deed restrictions would limit disturbance of the groundwater impacts under current site use and would prevent residential development and water well installations in the future.

Assessment of the effectiveness of the selected remedies will include groundwater level, NAPL depth, and NAPL thickness monitoring from the wells listed in the Facility CMS Monitoring Network. ExxonMobil will monitor the wells semi-annually and submit to MDEQ a semi-annual progress report for the monitored NAPL depth, NAPL thickness, and groundwater elevations.

3. River Boundary Area

Air sparging, monitored natural attenuation, phytoremediation, and institutional controls are the proposed remedies for this area.

A projected 32 air sparging wells will be installed to inhibit migration of impacted groundwater beyond the property boundary and enhance subsurface conditions for biodegradation. Air sparging will consist of installing specially designed wells to a depth several feet below the historic water table elevation. Atmospheric air will be injected through the wells to increase dissolved oxygen concentrations to the passing groundwater and strip volatile hydrocarbon compounds. Since hydrocarbon-degrading bacteria utilize oxygen as an energy source, air sparging should enhance subsurface conditions for biodegradation which will further reduce contaminant concentrations in the groundwater.

Natural attenuation is naturally occurring physical, chemical, and/or biological processes that act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in the groundwater. ExxonMobil will need to monitor natural attenuation to ensure it continues to be an effective remedy.

Phytoremediation has been used as an interim remedial measure and has shown success. The phytoremediation plots consist of planted vegetation along the river boundary to remediate dissolved phase constituents and perform limited hydraulic control. The phytoremediation system includes dense rows of trees (poplar and willow) planted parallel to the bank of the Yellowstone River. These rows of trees should provide in-situ remediation of impacted groundwater through contaminant removal, degradation, or containment.

21 wells in the River Boundary Area will continue to be sampled semi-annually to

monitor the effectiveness of all proposed and interim measure remedies.

Institutional controls include the following:

- Site access restriction;
- An ExxonMobil Refinery prohibition preventing the installation of water supply wells and/or groundwater producing wells for any purpose in the impacted hydrostratigraphic units; and
- On-site deed restrictions.

Currently groundwater is not extracted from impacted hydrostratigraphic units for beneficial uses and restrictions are in place to prevent such usage. Deed restrictions would limit disturbance of the groundwater impacts under current site use and would prevent residential development and water well installations in the future.

VI. EVALUATIONS OF PROPOSED REMEDIES

Below is a description of each selection criteria that was evaluated for the proposed remedies at the Refinery. These evaluations can also be found in Appendix A Tables 4-6.

Alternatives that were evaluated using these criteria but were eventually rejected can also be found in Appendix A Tables 4-6 with a short description of the reason for their rejection.

1. Technical Performance

The proposed remedies are expected to reduce subsurface free-phase hydrocarbon mass through vacuum-enhanced recovery, natural attenuation, and phytoremediation. The air sparging system would cut off dissolved-phase hydrocarbon plumes at the river boundary.

2. Reliability

The proposed remedies include the use of wells, vacuum trucks, compressors, and other associated equipment. Reliability depends on meeting the multiple operational and maintenance requirements of the various wells and associated equipment.

3. Implementability

There are no substantive obstacles to the implementation of the proposed remedy. The vacuum-enhanced NAPL recovery and air sparging systems will use many existing wells. The installation of necessary new wells may be hindered by utilities and other structures. However, MDEQ and ExxonMobil believe suitable new well locations are available, if needed.

4. Safety

On-site workers would encounter common safety hazards during construction due to drilling equipment and construction activities. Risk to nearby communities and environmental receptors would be negligible during construction or operation. Slope stability near the riverbanks could be a serious safety hazard. Buried and overhead utilities would have to be located and avoided during construction.

5. Environmental Concerns

The proposed remedy should reduce subsurface free-phase hydrocarbon mass and should cut off dissolved-phase hydrocarbon plumes at the river boundary, which will reduce the long-term environmental exposure.

6. Human Health Concerns

The proposed remedy would have potential short- and long-term risks to site workers during construction and the routine operation and maintenance of the systems. Hazards can be reduced with proper use of personal protective equipment (PPE) and engineering controls.

7. Regulatory Compliance

No additional regulatory compliance issues have been identified relative to implementation of the proposed remedy. However, historical releases of petroleum hydrocarbons at ExxonMobil have resulted in some NAPL plumes. Samples from wells in the interior refinery area and river boundary area have contained benzene above Circular DEQ-7 standards. The proposed remedy should remediate impacted groundwater to below Circular DEQ-7 standards.

8. Cost

ExxonMobil used a 20-year timeframe to calculate costs for the remedial alternatives at the site in an effort to compare and evaluate the different remedies. Therefore, the total

cost of the proposed remedy (\$5,935,296.00) is based on a total projected life of 20 years. However, ExxonMobil estimates that contaminant concentrations in the groundwater and subsurface soils in the three remediation areas will meet or exceed Circular DEQ-7 standards in 20 years and, therefore, a rolling 20-year timeframe will be required for financial assurance of the selected remedies.

VII. PUBLIC PARTICIPATION

MDEQ is seeking input from the public on both the selected remedies described in this Statement of Basis and the draft Permit Modification. MDEQ has set a public comment period from December 22, 2008 through February 13, 2009 to encourage public participation in the remedy selection process. The public, including interested citizens, MDEQ, EPA, other governmental agencies, and ExxonMobil are encouraged to review and comment on the draft permit modification and proposed corrective action remedies before a final decision is made by MDEQ.

The Statement of Basis, draft permit modification, and other associated documents will be available for review at the following locations:

Montana Department of Environmental Quality Permitting and Compliance Division Waste and Underground Tank Management Bureau 1520 E. 6 th Ave. Helena, Montana 59620	Montana Department of Environmental Quality Airport Business Park, 1P-9 1371 Rimtop Drive Billings, Montana 59105
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Only the changes proposed in the permit modification and remedies selected in the Statement of Basis are open for public comment (40 CFR 124.5(c)(2)). All persons wishing to comment on the draft permit and/or the proposed remedies should submit comments in writing to:

Ann M. Kron
Environmental Science Specialist
Waste and Underground Tank Management Bureau
Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901

All comments must be received by the MDEQ on or before February 13, 2009 for consideration.

Any supporting material that is submitted must be included in full and may not be referenced unless the material is a generally available reference material.

The MDEQ will prepare a Response to Comments after reviewing all comments. The Response to Comments will: 1) explain any changes to the draft permit modification including the proposed remedies; and 2) describe and respond to all significant comments. The MDEQ will then issue, issue with changes, or deny the permit modification and remedy selection.

When MDEQ makes a final decision on the draft permit modification and selected remedies, notice will be given to the applicant and each person who submitted written comments or requested a notice of the final decision. The final permit decision shall become effective thirty (30) days after the service of the notice of the decision unless a later date is specified. If no comments are received on the draft permit modification and selected remedies, the final permit decision and selected remedies shall become effective immediately upon issuance.

Please contact Ann Kron at (406) 444-5824 or at the address listed above for more information.